101 Careers in Mathematics Profile

C. A. Meyers

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Carol Meyers

Mathematician and Project Manager
Lawrence Livermore National Laboratory

BA Mathematics
Pomona College

PhD Operations Research
Massachusetts Institute of Technology

Don't you hate it when you meet someone for the first time, and you tell them you are a math major, and the response you get back is, "oh, math! I have always hated math!" These sorts of exchanges used to make me so sad when I was in college, because I thought math was both beautiful and awesome. I resolved then that I wanted a career where I could use math to tackle interesting real-world problems, so that when people asked me about my job, they would say, "Wow, cool! You use math to do that?"

I work at Lawrence Livermore National Laboratory, which is home to the world's largest laser, frequent home to the world's fastest supercomputer (those records don't last long), and the namesake to element 116 (Livermorium) on the periodic table. National labs serve a role between academia and industry, solving problems too large and too applied for academia, and insufficiently profit-driven to be tackled by industry. Most of our work is funded by government agencies and all of it is "in the national interest," meaning we create science and technology solutions for the country's biggest problems.

Some of the areas in which I have worked include: energy grid modernization, nuclear counterterrorism, cyber security, stockpile stewardship, and supercomputing. My mathematical background is in optimization and I am often brought in as a consultant offering mathematical modeling expertise. This usually involves working with teams of other scientists, including engineers, physicists, computer scientists, earth scientists, and statisticians, and often in collaboration with other national labs and academia. I've gotten to visit some pretty cool places as a result of my job, including touring a nuclear submarine, a stealth bomber, an explosives range, a B-52 aircraft, and the Pentagon.

One of the projects I have led involved taking a commercial energy grid modeling software code and showing how we could run it on supercomputers to change the scale of problems that could be answered. In this case my expertise in integer programming optimization was crucial for understanding the 'guts' behind the commercial code, while computer scientists on my team ported the code to work on supercomputers. We were also fortunate to have two fantastic industry partners who implemented modifications to both the commercial energy code and its underlying optimization software.

Being a math major is helpful in my occupation not just in terms of providing subject matter expertise to areas that need it, but also in terms of building models for problems that can be difficult to express quantitatively. For instance, many government policy questions cannot easily be stated in numerical terms, and our job is to figure out ways to evaluate these policies given the data that we have combined with the qualitative thoughts of experts in the field. Having a logical foundation in mathematics really helps to take these abstract ideas, make them concrete, and then find a way to assess them.

In addition to the extremely diverse set of problems that I am able to work on, one of my favorite parts about working at a national lab is the priority placed on achieving a manageable work-life balance. I have two young kids (ages 1 and 5) who attend our employer-affiliated daycare, and there is a tremendous peace of mind in that. I am also co-chair of the new moms' group at my workplace, which has been a fantastic resource to me in terms of providing a supportive network of people who deal with many of the same issues and lobby for change when needed. Altogether my workplace is a consistently interesting place to be, and I am happy that math has brought me here.